4. SHORT-RUN PRICING PERFORMANCE OF LOCAL AND DUAL CLASS IPOS IN ALTERNATIVE INVESTMENT MARKET

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Abstract

In most of the traditional markets, one may observe a rapid escalation in the trading prices of many IPOs on the listing day. The closing price of new issues on the first trading day is often much higher than the offering price six hours earlier. The price dynamic varies among markets and has never been satisfactorily explained. This study examines the short-run performance of IPOs issued in an Alternative Investment Markets (AIMs). In this study, we apply the Extreme Bounds Analysis (EBA) to predict the robust factors which explain the behavior towards short-run pricing performance of unseasoned issues. We conclude that, on average, IPOs are underpriced by 2.48%, 2.62% and 2.16% on the first, fifteenth and thirtieth day of trading, respectively. In addition, we find that demutualized IPOs are less underpriced than local IPOs. However, cross-listed IPOs are more underpriced on the fifteenth and the thirtieth day of trading relative to local and demutualized IPOs. This study concludes that the offer price is the most robust determinant of the short-run performance of unseasoned issues. This finding implies that a lower offer price leads to greater probability of underpricing. The results of the study have a practical value for those investors who are especially interested in earning abnormal excess returns in an AIM.

Keywords: short-run price performance, local IPOs, dual class IPOs, extreme bounds analysis, alternative investment market

JEL Classification: G11, G14, G15

Introduction

Underpricing is a well-established phenomenon where Initial Public offerings (IPOs) are sold in traditional markets. That finding has been documented in various markets around the

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globe (*e.g.* Ritter, 1984, 1998; Ascherl and Schaefers, 2018; Rathnayake *et al*., 2019). Underpricing is defined as the difference between the market price at the end of the first day of trading and the offer price determined by the issuer and the underwriting syndicate. Numerous theories have attempted to explain the causes of underpricing and the short-run price behavior of IPOs. Many of these theories are consistent with empirical data. However, there remains the question of how IPOs behave in sub-markets. A large literature is focused on IPOs performance in the main market while the evidence of IPOs performance in alternative markets is limited.

The objective of this paper is to contribute to a better understanding of the short-run performance of IPOs in the Alternative Investment Market (AIM). This is a fertile ground for research for three reason: (a) During the past two decades, only 21.9% new issues were listed on the main market [*e.g*. London Stock Exchange (LSE)] while rest of new issues were listed on the AIM; (b) Only about a quarter of the companies listed in the AIM were eligible for listing on the US stock exchange before the Sarbanes-Oxley Act was enacted into law; (c) From the point of view of investors, the price behavior of IPOs in the AIM may identify opportunities for the diversification of portfolio to obtain abnormal returns.

Rock (1986) found a general trend among the investors of main market to buy the stocks from secondary markets at prices exceeding the intrinsic value of the stocks. This process is the result of information asymmetry. In this study, we test information asymmetry hypothesis in an alternative market. That market allows us to study how well investors are informed about local IPOs in general as well as dual class IPOs (*i.e.* cross-listed and demutualized IPOs) in particular. When issuing new shares, a firm is required to offer a specific amount of stock in the main market. That requirement does not exist in the alternative market. In addition, firms are not required to disclose the abundance of specific financial information to execute transactions on the alternative market. Previous studies examined possible explanations for short-run price variability of IPOs. The hypotheses consist of: (a) the winner's curse hypothesis; (b) the *ex-ante* uncertainty hypothesis; (c) the underwriter reputation hypothesis; (d) the signaling hypothesis; and (e) the ownership dispersion hypothesis. All these hypothetical explanations have been tested across different time spans and in different markets. The findings are inconclusive.

In this study, we examine five questions: (i) how can one characterize short-run price performance of IPOs issued in the AIM? (ii) How does the prestige of the underwriter(s) influence the performance of new issues? (iii) Do market conditions in the AIM affect the pricing dynamics of IPOs? (iv) Are the price dynamics of IPOs influenced by the size of the issue? and (v) What are the robust predictors that influence the short-run price performance of IPOs in the AIM? The five questions described above will be investigated by applying multivariate OLS and Extreme Bounds Analysis (EBA) to data generated in the AIM. The purpose of employing the EBA technique is that it reduces the ambiguity in selecting the explanatory variables and thereby reduces model uncertainty (Leamer, 1985; Renelt, 1992). We consider the sample of IPOs issued in the AIM between 2001 and 2017 and examine how IPO prices in that market behave in short-run.

2. Theories of IPO Short-run Pricing Behavior

The first to analyze the price performance of IPOs and report the anomaly of abnormal returns were Reilly and Hatfield (1969). Subsequent studies confirmed those findings in almost all equity markets (Pandya, 2016). However, the magnitude of abnormal return varies from market to market. Various studies (*e.g.* Abdullah, Jia'nan and Shah, 2017; Dhamija and

Arora, 2017; Badru and Ahmad-Zaluki, 2018; Hanafi and Setiawan, 2018; Hawaldar, K.R. Naveen Kumar and Mallikarjunappa, 2018; Arora and Singh, 2019) reported different magnitudes of underpricing in different geographical regions. Examples are 21.14% in the USA (640), 43.95% in Japan (609), 20.16% in the UK (471), 18.04% in Australia (437), 13.12% in France (171), 37.20% in Germany (132), 34.97% in Greece (124) and 32.04% in the Indian market (292). Some studies have examined the extent of underpricing in highly volatile and emerging markets. Studies have found an average initial return of 462% for 101 IPOs issued in the 1990–1993 period in China (Tan *et al.,* 2015), 231% for 308 IPOs issued in the 1985–1995 period in China (Haggard *et al.,* 2015), 175% for 570 IPOs issued in Malaysia (Komenkul and Kiranand, 2017).

A variety of hypothetical explanations have been tested in different markets. For example, Rock (1986) found a general trend among the investors to buy the stocks in secondary markets at prices exceeding the intrinsic value. This process was described as information asymmetry (Kashefi Pour, 2017). Notwithstanding many years of study, the volatile price dynamics of IPOs have not been satisfactorily explained. Some studies classified investors into two categories: informed and uninformed investors (Sundarasen, Khan and Rajangam, 2018). Informed investors are defined as those who attempt to collect firm specific information about new offerings, taking into account the cost of acquiring that information (Ascherl and Schaefers, 2018). Some studies theorize that informed investors estimate the intrinsic worth of new issues on the basis of available information (Dodd and Gilbert, 2016). An alternative approach suggests that investors misprice the offering due to incomplete information relating to the firm's specific characteristics. Earlier studies used various proxies relating to information covering age of the firm at the time of offering (Guo *et al.,* 2011, Baluja 2018), return on asset (Park and Patel, 2015) and financial leverage (Mumtaz *et al*., 2016).

Some studies also focused on the ex-ante uncertainty hypothesis as a factor responsible for underpricing (see Mantell, 2016). This theory is based on the argument that the risks perceived by investors can be dichotomized into pre- and post-IPO uncertainty (Clarkson and Merkley, 1994). Genesis of pre-IPOs risk is linked with firm's capacity and performance. This risk may arise because of market regulations (Yang *et al.,* 2018), market competitiveness (Alim and Ramakrishnan, 2017), and industry performance. Other studies documented that post-IPOs risk is manifested as market trading risk (Baluja, 2018), attainment of market skills and routine (Badru and Ahmad-Zaluki, 2018) and managing an expanding shareholder base with often conflicting demands. Ex-ante uncertainty is manifested through various dimensions such as aftermarket risk (Badru and Ahmad-Zaluki, 2018), the firm age at the time of offering (Rathnayake *et al.,* 2019), the offer size, and oversubscription (Komenkul *et al.,* 2017). One of the theories purporting to explain the price performance of IPOs related to the prestige of the underwriters. This theory suggests that if the underwriter has a good reputation the probability of underpricing will be lower (Arora and Singh, 2019). Several methods have been adopted to measure the underwriter's prestige. An example is the theory that the magnitude of the market capitalization raised by a specific underwriter is a signal of its prestige (Migliorati and Vismara, 2014). Most of the studies reported a significantly negative role of underwriter's prestige in underpricing of IPOs (Khurshed *et al.,* 2016; Arora and Singh, 2019). Other studies documented the role of market factors in the underpricing of IPOs. The signaling hypothesis is the one of the most debated theories. That theory suggests that sometime high quality large firms intentionally underprice their issuance to differentiate their status in market from low quality firm (Badru and Ahmad-Zaluki, 2018). Market sentiments and investor sentiments are also included in signaling

theory. Market signals and investors sentiments have been used as proxies of signaling hypothesis (Obrimah, 2018; Colombo *et al.,* 2019).

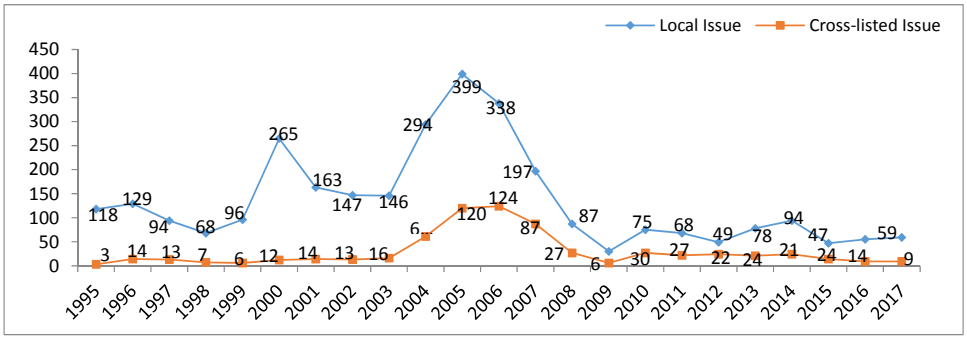
The ownership dispersion hypothesis has been applied in the IPO literature to theorize that management of the IPO firm intentionally underprices their issue to attract small shareholders. The purpose of dispersal of ownership is to create liquidity in the market for the shares. However, the published empirical research has not been able to establish a significant correlation between ownership dispersion and abnormal returns. The agency hypothesis explains the conflict of interest between management and stockholders. Previous studies (Kashefi Pour, 2017; Hanafi and Setiawan, 2018) attributed agency conflict as a responsible factor for insider holding. Those authors found a positive empirical relation between firm value and insider holdings (Ascherl and Schaefers, 2018). This paper incorporates the theories outlined above to test the fundamental question: what factors explain underpricing if the firm issues its IPO in the AIM?

2. Methodology

The AIM is a sub-market (or alternative market) of the London Stock Exchange. It was launched on June 19, 1995. Initially, the AIM consisted of only ten listed companies that were valued collectively at £82.2 million. By the end of 2017, over thousands of companies were traded on the AIM. The average market capitalization is £80 million per listing. AIM has evolved as an international exchange mainly because of its relatively modest regulatory burden. Currently, there are more than 3,700 listed firms including local and cross-listed companies. A majority of the listed firms conduct their operations outside the UK in more than 100 countries (Dodd and Gilbert, 2016). Figure 1 suggests that listings on the AIM are more sensitive to gross market effects than the cross-listed firms. To test this hypothesis, we select 362 IPOs listed on AIM. The sample of the study is comprised three sub-samples: (a) newly listed/local IPOs, (b) cross-listed IPOs, and (c) demutualized IPOs.

Figure 1

History of IPOs in the AIM



Source: London Stock Exchange.

To examine the short-run IPO performance, we calculate the market adjusted abnormal return, symbolized by MAAR. It is computed for each firm using Financial Times Stock Exchange (FTSE-AIM Index) as a benchmark. We follow the methodology used by Aggarwal, Leal and Hernandex (1993) to measure the short-run performance:

$$\text{Market Adjusted Abnormal Return} = \left[\left(\frac{1+R_{i,1}}{1+R_{m,1}}\right) - 1\right] \text{x } 100 \quad (1)$$

where: Ri,1 is the raw return of stock at the end of first trading day. Total return is calculated as: $R_{i,1} = \frac{P_{i,1} - P_{i,0}}{P_{i,0}}$ where: $P_{i,1}$ is the price of stock *i* at the close of the first trading day, $P_{i,0}$ is the offer price. $R_{m,1}$ is the market return measured during the corresponding period as: $R_{m,1} = \frac{I_{m,1} - I_{m,0}}{I_{m,0}}$ where: $I_{m,1}$ is the market index at the close of first trading day and $I_{m,0}$ is the market index value on the offer day of the respective stock. An objective of this study is identification predictors that explain the short-run pricing performance in alternative market. To identify those factors, we develop the following empirical model:

$$MAAR_{1stday,15\ and\ 30\ Day} = \delta_0 + \delta_1 Risk_i + \delta_2 Off_{Price_i} + \delta_3 RoA_i + \delta_4 FinLev_i + \delta_5 UW_i + \delta_6 Mkt_{return_i} + \delta_7 Mkt_{vol_i} + \delta_8 Firm_{Size_i} + \delta_9 Mkt_{Condition_i} + \delta_{10} Off_{Size_i} + \delta_{11} age_{firm_i} + \delta_{12} RIS_i + \delta_{13} List.Del_i + \delta_{14} YFin\_Crisis_i + \delta_{14} YDM_i + \mu_i \quad (2)$$

MAAR is computed on the first, fifteenth and thirtieth trading day; Risk refers to the aftermarket risk level of the IPO and is defined as the standard deviation of post-issue pricing during the first 45 trading days. Off-price is the offer price of new issues. ROA is the return on assets. It is estimated as net income divided by total assets. FinLev is the financial leverage of firm prior to IPO. It is measured as long-term debt divided by total assets. UW is a dummy variable. It is assigned a value of 1 if the prestige of underwriters is high and 0 otherwise. Mkt_return is defined as the market return. It is measured through FTSE-AIM index calculated over the 45 trading days prior to the first day of IPO trading. Mktvolatility is the market volatility measured by the standard deviation of market returns during the 45 trading days prior to IPO. Firm Size is measured as the logarithm of total assets. Market condition is a dummy variable: if IPO is issued in a rapidly rising market it assumes a value of 1, otherwise 0. Mktcondtion is calculated through Markov switching regression. In case of bull market, it assumes a value of 1 and 0 otherwise. Off size is the size of the IPOs in the sample. It is measured by the natural logarithm of the number of shares offered multiplied by the offer price. Agefirm is the age of firm prior the issuance of IPO. It is measured as the difference between the date of incorporation and the offering date. RIS is the ratio of internal shareholding. It is measured by the number of internal shareholders divided by total outstanding shareholders. List.Dely is calculated as the natural logarithm of number of days separating the closing of subscriptions and the first day of trading. YFin_Crisisis is a dummy variable designed to capture the significance of the global financial crisis. It is assigned a value of 1 during the crisis, 0 otherwise. YDM is a dummy variable. It is assigned a value of 1 for a year in which the number of IPOs exceeds the average and 0 otherwise. In this study, we apply event study methodology. Basically, an event study analyses the effect on the stock price before and after a discrete event which is expected to cause an extraordinary and abrupt movement in the stock price, e.g. IPO.

According to Cooley & Leroy (1981), econometric theory does not identify the variables that should be specified in a statistical technique or model. In order to address this issue, Leamer (1983, 1985) developed the Extreme Bound Analysis (EBA) technique. This technique was applied for the first time by Levine and Renelt (1992). Variations of the technique have been developed but its reliability has been questioned. The research in this paper applies the EBA to test the sensitivity of desired outcomes to specification changes. Its application reduces the uncertainty of model specification and reliability (Leamer, 1985). Moosa and Cardak (2006) specified the following regression:

$$Y_i = \beta_0 + \sum_{ip=1}^{n} \beta_c X_{ipi} + \mu_i \quad (3)$$

where: Y_i is the dependent variable of firm i;

X_{ipi} is the explanatory variable of firm i;

and μ_i is the error term.

This technique was used to select the predictors of IPO price movements in the short-run. Under this method, independent varriables are segregated into three catagoties, such as; (a) fixed variable(s)–X, (b) variable of interest–Q, and (c) a subset of Z variables. In this model, fixed variables are those variables which have been confirmed as significant determinants of the short-run performance of IPOs. The variables of interest are those whose sensitivity we want to test. The Z variables are a combination of the all fixed variables and variables of interest. To examine the statistical significance of the explanatory variables, the EBA technique is applied with the following econometric specification:

$$Y_i = \beta_0 + \sum_{ip=1}^{n} \delta_c X_{ipi} + \beta Q_i + \sum_{ip=1}^{m} \delta_c z_{ipi} + \mu_i \quad (4)$$

3. Findings and Discussion

3.1. Short-run IPO Performance in Different Category and Time Span

Table 1 illustrates that, on average, abnormal returns of IPOs are reported as 2.48%, 2.62% and 2.16% at 95% significance level ($p< 0.05$) on the first, fifteen and thirtieth day of trading, respectively, in an alternative market. Similarly, this trend was observed in local IPOs as 2.67%, 2.61% and 2.18% at $p <0.05$ on the first, fifteen and thirty day of trading, respectively. These findings are consistent with previous studies which indicate that, on average, IPOs are underpriced on the listing day (Ascherl and Schaefers, 2018). Previous studies reported that 'IPOs underpricing' is a pervasive phenomenon in the main markets and underpricing of newly listed IPOs varies from market to market and across different time periods (Bakke *et al.*, 2016).

For the purpose of measuring the short-run price performance of IPOs, the market adjusts excessive abnormal return amount with real valuation and intrinsic pricing of IPO (Mumtaz and Smith, 2017). According to those researchers, the market adjustment tends to reduce the abnormal return of IPOs. The methodology was used to study the price behavior of local IPOs in the sample. On average, short-run performance of demutualized IPOs is reported at 1.62%, 1.10% and -0.362% on the first, fifteen and thirty day of trading, respectively. This illustrates that demutualized IPOs are lesser underpriced than local IPOs because demutualized IPOs are generally offered by local firms which have a strong historical performance in the local market. In addition, these firms have also been trading in local market for decades, with the consequence that underwriters have more access to accurate information about firms as compared to information about newly listed IPOs. This asymmetric information results in a significant difference between the value imputed by the 'market' and the 'underwriter' to the shares of demutualized IPOs.

In the cross-listed IPOs, abnormal returns are reported as 2.10%, 3.33% and 3.19% on the first, fifteen and thirty day of trading, respectively. The underpricing of cross-listed IPOs is

higher on fifteen and thirty day of trading relative to local and demutualized IPOs. This may be linked to the prestige associated with the cross-listed IPOs in an alternative market. In addition, the first day abnormal return is lower than that on the fifteenth trading day. That difference suggests that the market adjusts this smaller abnormal (underpricing) with real valuation and intrinsic pricing of IPO (Amin, Wu and Tu, 2019). Alternatively, it might mean that the demand for the international IPOs increases its value in the market. That would tend to increase the abnormal return until the fifteen day of trading.

These findings support the hypothesis related to the short-run performance of IPOs; that hypothesis states that underpricing of IPOs may be due to lack of information. Risk associated with the future performance of these IPOs manifested as the "winner's curse" hypothesis. The "ex-ante uncertainty hypothesis" relates to the information asymmetry and emphasizes the investment risk faced by prospective investors. Cross-listed IPOs might be underpriced to attract attention of the local investors towards these IPOs. That theory supports the "signaling hypothesis". Demutualized IPOs are less underpriced due to availability of information and full access to information by underwriters, which supports the "ex-ante uncertainty hypothesis" related to information asymmetry. The descriptive statistics are displayed in Table 1.

Table 1

Short-run Performance of Local, Cross-listed and Demutualized IPOs

Company Status	MAAR	N	Min.	Max.	Mean	Std. Dev.
Newly Listed IPOs	First trading day	266	-43.44	49.87	2.67**	16.53
	Fifteen trading day		-46.48	50.77	2.61**	19.60
	Thirtieth trading day		-47.92	51.82	2.18**	20.64
Demutualized Firm's IPOs	First trading day	29	-21.02	26.67	1.62	10.65
	Fifteen trading day		-38.53	34.41	1.10	14.10
	Thirtieth trading day		-46.74	51.07	-0.36	18.77
Cross-listed IPOs	First trading day	67	-30.17	51.48	2.10	17.12
	Fifteen trading day		-33.04	52.07	3.33	19.47
	Thirtieth trading day		-38.36	52.35	3.19	21.70
Overall Sample	First trading day	362	-43.44	51.48	2.48**	16.22
	Fifteen trading day		-46.48	52.07	2.62**	19.16
	Thirtieth trading day		-47.92	52.35	2.16*	20.66

*Note: This table exhibits underpricing of overall sample of 362 IPOs which includes 266, 29 and 67 firms from the newly listed IPOs, demutualized firm's IPOs and Cross-listed IPOs respectively listed on the AIM from 2001 to 2017. T-test is used to test the significance of abnormal return *, ** indicates significant at 95% and 99% level, respectively.*

Table 2 displays the short-run performance of IPOs across different time periods. The period of 2001-2017, which includes the period of the financial crisis, produced more abnormal returns as compared to pre-crisis period (2001-2005) and post-crisis period (2012-2017).

Table 2

Short-run IPO Performance across Different Time Spans

Period	MAAR	N	Min.	Max.	Mean	Std. Dev.
2012-2017	First trading day	165	-42.53	49.87	1.69	17.47
	Fifteen trading day		-42.93	50.79	2.31	20.19
	Thirtieth trading day		-47.18	51.86	1.47	21.16
2006-2011	First trading day	100	-43.44	51.48	3.54*	15.28
	Fifteen trading day		-46.48	52.07	3.94**	19.40
	Thirtieth trading day		-47.92	52.35	2.90	21.30
2001-2005	First trading day	97	-36.18	47.05	2.75	14.99
	Fifteen trading day		-44.36	44.62	1.80	17.12
	Thirtieth trading day		-46.74	42.25	2.57	19.25

*Note: This table depicts the short-run performance of various categories of IPOs by issue year during 2001 to 2017 splitting it into three phases that are (a) 2001-2005, (b) 2005-2011 and (c) 2012-2017. T-test is used to test the significance of abnormal return. *, ** indicates significant at 95% and 99% level, respectively.*

3.2. The Short-run IPO Performance Influenced by Underwriters' Prestige

According to Sundarasen, Khan, and Rajangam, (2018), the prestige and experience of underwriters impact the level of short-run price performance of IPOs in the main markets. If the underwriters are very experienced in managing IPOs, they would be able to estimate a reliable intrinsic value of new issues. To the extent that experienced underwriters can accomplish this, one would expect to observe fewer instances of mispricing. Earlier studies (McLeod *et al.,* 2018; Arora and Singh, 2019) found that high prestige underwriters tended to result in lower underpricing because they had more resources and information to calculate the intrinsic worth of an IPO. Table 3 shows that high prestige underwriters evaluate the information more appropriately, which results into lower underpricing relative to low prestige underwriters. These findings are consistent and support the pervious literature (Brobert, 2016; Colombo *et al.,* 2019) that high underwriter's prestige results into low underpricing and vice versa.

Table 3

Short-run IPO Performance by Underwriter's Prestige

Underwriter prestige	MAAR	N	Min.	Max.	Mean	Std. Dev.
High Prestige	First trading day	222	-42.53	49.87	0.09	16.59
	Fifteen trading day		-42.93	50.77	0.41	19.92
	Thirtieth trading day		-47.18	51.82	-1.49	20.20
Low Prestige	First trading day	134	-43.44	51.48	3.89**	15.87
	Fifteen trading day		-46.48	52.07	3.92**	18.61
	Thirtieth trading day		-47.92	52.35	4.31**	20.67

*Note: This table depicts the short-run performance of various categories of IPOs by underwriter's prestige during the 2001 to 2017 period. High and low underwriter's prestige is calculated through the median of total market capitalization. If the total market capitalization of specific underwriter is higher than the median then it is categorized as high prestige. T-test is used to test the significance of abnormal return. ** indicates significant at 95% level.*

3.3. The Short-run IPO Performance Influenced by Market Conditions

Market sentiment is directly associated with underpricing of IPOs. To measure the market effect, cumulative returns for the period of 45 days before the listing day is commonly used as a proxy for the market sentiment. Market condition or sentiment is categorized as bear, bunny and bull using Markov switching regression. Various studies used different time periods terminating on the date of listing to measure the market sentiment effect: the time periods included 90 days (Mumtaz *et al.,* 2016), 60 days (Clarke *et al.,* 2016) and 45 days (Strau and van der Meer, 2017).

In the context of general market behavior, we used 45 days ending prior to the listing day as a proxy of market sentiment. Table 4 shows that when the market returns decline by about 2%, IPOs are underpriced on average by 3%. Likewise, when market returns increase by about 3% to 4%, IPOs tend to be underpriced on average by 3% to 4%. During the bunny market period, the results report lowest returns in the sample IPOs. This generally occurs due to lower market volatility and slow growth during this period. This finding supports the investor sentiment hypothesis explaining a positive relationship between market returns and short-run performance of new issues.

Table 4

Short-run IPO Performance by Market Condition

Market Condition	MAAR	N	Min.	Max.	Mean	Std. Dev.
Bear (>-2.74 %, < 0%)	First trading day	111	-37.81	49.87	3.47	15.90
	Fifteen trading day		-44.36	47.90	2.91*	18.14
	Thirtieth trading day		-44.84	52.35	2.52	20.07
Bunny (>0 %, < =2%)	First trading day	154	-43.44	38.67	1.66	16.16
	Fifteen trading day		-46.48	50.77	2.09	19.40
	Thirtieth trading day		-47.92	51.33	1.61	21.09
Bull (>2 %, =< 6.18%)	First trading day	97	-41.32	51.48	2.67	16.78
	Fifteen trading day		-42.91	52.07	3.15*	20.06
	Thirtieth trading day		-47.18	41.67	2.63	20.82

*Note: This table depicts the short-run performance of various categories of IPOs by market sentiment or investor's sentiment during the 2001 to 2017 period. Market condition is estimated through Markov switching model. Lowest, and highest return margin is calculated through Markov switching model. Lowest margin is categorized as bear, highest is bull and otherwise is bunny market. The t-testis used to test the significance of abnormal return. * indicates significant at 99% level.*

3.4. The Short-run IPO Performance by Country of Incorporation

It is generally observed that local IPOs produce more abnormal returns on the first trading day as compared to the returns in the developed and emerging markets IPOs. Table 5 offers evidence that, on average, investors earn higher abnormal returns on newly listed IPOs in the UK local market as compared to the cross-listed IPOs from the developed, emerging and developing markets. Conversely, investors earn higher returns on cross-listed IPOs from the emerging and developing markets than the developed markets. This implies that firms from local markets 'left more money on the table' as compared to the developed and emerging market companies.

Table 4

Short-run IPO Performance by Country of Incorporation

Country of Incorporation	MAAR	N	Min.	Max.	Mean	Std. Dev.
Local IPOs (UK)	First trading day	301	-43.44	51.48	2.57**	16.29
	Fifteen trading day		-46.48	52.07	3.11**	19.65
	Thirtieth trading day		-47.92	52.35	2.67**	21.24
IPOs from Developed Economies	First trading day	22	-21.93	33.27	4.81	12.58
	Fifteen trading day		-44.36	35.79	2.28	16.48
	Thirtieth trading day		-43.96	26.69	1.98	18.23
IPOs from Emerging Economies	First trading day	39	-42.53	33.50	0.50	17.62
	Fifteen trading day		-42.93	40.85	-0.97	16.50
	Thirtieth trading day		-32.85	44.54	-1.63	17.07

*Note: This table depicts the short-run performance of various categories of IPOs by domiciled during the 2001 to 2017 period. t-test is used to test the significance of abnormal return. ** indicates significant at 95% level.*

3.5. The Short-run IPO Performance by Issue Size

The available literature has documented the nexus between the short-run IPO performance and the size of the issue. To measure that effect, we divide the sample into four strata defined by market capitalization. Table 6 shows that small issues are less underpriced relative to large issues. This finding is in line with many other studies (Mantell, 2016; Badru and Ahmad-Zaluki, 2018). However, our findings are contrary to the findings of some earlier studies because the results in this study show that mature firms are more stable because they have more options to generate funds, thereby yielding higher abnormal returns. The probable explanation for this finding is that the large-sized firms have more diversified opportunities, leading to investments generating higher abnormal returns.

Table 5

Short-run IPO Performance by Issue Size

Issue Size	MAAR	N	Min	Max.	Mean	Std. Dev.
<11.22 (£m)	First trading day	92	-42.53	41.60	2.40*	17.61
	Fifteen trading day	92	-42.93	48.81	2.96**	19.32
	Thirtieth trading day	92	-45.85	51.33	2.21*	20.41
11.22-28.020 (£m)	First trading day	95	-41.32	49.87	1.09	16.58
	Fifteen trading day	95	-42.91	52.07	2.18*	20.05
	Thirtieth trading day	95	-47.18	51.82	0.94	21.26
28.020-78.744 (£m)	First trading day	88	-43.44	51.48	3.61**	16.43
	Fifteen trading day	88	-46.48	48.73	3.15**	20.35
	Thirtieth trading day	88	-47.92	52.35	2.64	22.05
78.744 -784.15 (£m)	First trading day	87	-33.66	47.05	2.97**	14.10
	Fifteen trading day	87	-44.36	44.62	2.22*	16.91
	Thirtieth trading day	87	-46.74	42.25	2.97**	19.04

Note: This table depicts the short-run performance of various categories of IPOs by issue size during the 2001 to 2017period. t-test is used to test the significance of abnormal return.

3.6 The Short-run Performance of IPO by Industry

Table 7 displays the short-term pricing performance of IPOs classified by industry. The distribution of initial abnormal returns shows variation of underpricing/overpricing ranging from lowest return (-5.22%), (-4.34%) and (-6.95%) to highest return (10.96%), (8.94%) and (13.45%) on the first, fifteenth and thirtieth day of trading in real estate and electronic and electrical equipment, respectively. The findings in the real estate classification are the result of continuous growth of real estate business. Between 2000 and 2016, the value of British residential prices grew significantly faster in value as compared to the FTSE All Share and the FTSE 100 ("Stocks and Shares vs. UK Property Investment). Persistent growth in the real estate market leads toward a higher demand for the shares of real estate firms listed in the AIM. Electricity producers, pharmaceutical & health care firms, industrial & construction material firms and firms in the media & telecom industry showed negative abnormal returns on the first, fifteenth and thirty day of trading in AIM. That finding could reflect the fact that these industries provided solid and useful information to underwriters during IPOs. In addition, this may occur due to lower demand of these IPOs in the market.

The other industries such as chemical, oil & gas, financial services, electronic & electrical, software & computer, travel services, mining, others and support services industries produce positive abnormal return in an alternative market during the 2001 to 2017 period. This finding is consistent with previous literature; namely that the offer price of IPO is lower than the price of stock on the first trading day. After the short-run, this discrepancy increases even in the absence of any substantial growth prospects and opportunities. As a result, these issues would not be able to justify the high pricing and the market adjusts their value with real valuation and pricing.

Table 7

Short-run IPO Performance by Industry

Sector	MAAR	N	Min.	Max.	Mean	Std. Dev.
Mining	First trading day	41	-29.88	37.35	1.24	15.73
	Fifteen trading day		-32.06	48.73	1.64	19.31
	Thirtieth trading day		-30.56	44.75	0.74	18.70
Media and Telecom	First trading day	17	-36.18	29.59	-0.94	17.71
	Fifteen trading day		-44.36	37.28	-0.77	23.05
	Thirtieth trading day		-43.96	36.56	-1.82	23.33
Software and computer	First trading day	31	-32.23	27.29	5.68**	14.46
	Fifteen trading day		-33.65	48.81	7.72**	17.22
	Thirtieth trading day		-29.25	51.33	6.37**	20.06
Travel services	First trading day	14	-8.73	49.87	8.56**	17.37
	Fifteen trading day		-38.53	41.95	1.26	17.45
	Thirtieth trading day		-46.74	51.82	-0.58	22.17
Support Services	First trading day	25	-33.66	40.55	1.69	14.26
	Fifteen trading day		-32.18	41.21	1.12	17.06
	Thirtieth trading day		-41.85	38.46	2.55	20.82
Industrial and Construction Material	First trading day	29	-41.32	27.03	-2.44	19.09
	Fifteen trading day		-42.91	36.77	-0.15	23.22
	Thirtieth trading day		-47.18	32.38	-2.47	24.90
Real Estate	First trading day	11	-36.25	14.17	-5.22*	15.19
	Fifteen trading day		-36.99	41.74	-4.34*	22.92

Sector	MAAR	N	Min.	Max.	Mean	Std. Dev.
	Thirtieth trading day		-32.58	27.27	-6.95**	19.28
Pharmaceuticals & Health care	First trading day	32	-42.53	31.82	-0.09	15.30
	Fifteen trading day		-42.93	32.17	-1.87	14.57
	Thirtieth trading day		-32.85	40.57	2.31	17.33
Financial Services	First trading day	67	-35.10	47.05	4.37*	17.89
	Fifteen trading day		-35.00	52.07	4.53*	19.77
	Thirtieth trading day		-45.85	42.27	2.79	20.66
Electronic & Electrical Equipment	First trading day	8	-26.09	33.50	10.96**	17.82
	Fifteen trading day		-26.92	40.85	8.94**	23.70
	Thirtieth trading day		-29.04	46.42	13.45**	27.94
Oil and Gas sector	First trading day	31	-30.17	51.48	5.23*	14.58
	Fifteen trading day		-31.20	46.48	8.19**	18.99
	Thirtieth trading day		-35.68	52.35	4.64*	18.85
Chemical	First trading day	6	-21.83	26.67	0.26	17.62
	Fifteen trading day		-24.00	34.41	-1.48	24.23
	Thirtieth trading day		-29.03	51.07	2.19	34.35
Electricity Producer	First trading day	8	-43.44	16.22	-3.25	18.55
	Fifteen trading day		-46.48	20.83	-3.32	21.47
	Thirtieth trading day		-47.92	30.72	-1.38	24.83
Others	First trading day	42	-31.05	34.38	3.34	13.49
	Fifteen trading day		-31.84	47.90	3.08	16.46
	Thirtieth trading day		-38.36	43.82	3.91	18.22

*Note: This table depicts the short-run performance of various categories of IPOs by industry during the period from 2001 to 2017. The t-test is used to test the significance of abnormal return. *, ** indicates significant at 95% and 99% level, respectively.*

3.7 Robust Determinants of Short-run Performance Using OLS and EBA Techniques

Table 8 displays the results of applying the EBA technique. The findings in the table suggest that the offer price is a single most important factor in determining the short-term performance of IPOs. The aftermarket risk and underwriter's prestige are taken as fixed variables. The negative sign and robustness of the offer price imply that a lower offer price tends to higher underpricing in the AIM. This finding also indicates that firm-specific variables, such as ROA, financial leverage, firm size and firm age, are statistically insignificant. Likewise, market-related variables including the market return, market volatility, market condition, period of financial crisis and dummy variable of financial crisis, are statistically insignificant factors. These findings support the ex-ante uncertainty and information asymmetry hypotheses.

Previous studies analyzed post IPOs, risk which emphasizes the importance of uncertainty faced by an IPO after its listing on the main market (Straub and van der Meer, 2017; Badru and Ahmad-Zaluki, 2018; Arora and Singh, 2019). We find that post IPOs risk is not associated with firm's capacity or its performance. This may occur because of market regulations, market competitiveness, and industry performance (Hanafi and Setiawan, 2018). However, in an alternative market, a firm can be listed without satisfying specific criteria regarding financial statements, trading history, minimum capital requirement and number of shareholders (Colombelli, 2010). The firms listed exclusively on the AIM face the

least amount of post-IPOs risk, which indicates low ex-ante uncertainty in terms of firm-specific characteristics in these markets.

Most of the studies measured post-IPOs risk using the market trading risk, which reflects market skills and the ability to deal with an expanding shareholder base with often conflicting demands. We find that market-specific factors do not significantly explain the short-run pricing performance. This may be attributable to maturity and persistency of market, low volatility in market risk & return in the AIM. These results support the risk minimization explanation in environments in which there are not strict regulations related to pre-requisites and ongoing performance. In an AIM, IPO firms can minimize their risk and cost of going public. In a broader context, our results show that self-disciplined markets (*e.g*. AIM) produce different results with respect to IPOs pricing as compared to the global main markets.

Table 8

Estimation Results Using OLS and EBA

	OLS (1st day)	EBA (1st day)	OLS (15th day)	EBA (15th day)	OLS (30th day)	EBA (30th day)
Aftermarket Risk	0.136	0.130	0.086	0.086	0.096	0.092
	(3.96)**	(3.88)**	(1.97)*	(2.03)*	(3.68)**	(3.58)**
Offer price	-0.483	-0.258	-0.423	-0.427	-0.642	-0.410
	(2.44)*	(2.90)**	(2.99)**	(2.18)*	(2.50)*	(2.87)**
ROA	0.779		0.629		1.387	
	(0.27)		(0.17)		(0.63)	
Financial Leverage	-5.485		0.503		-3.195	
	(1.61)		(0.12)		(1.23)	
Underwriter's Prestige	1.959	1.803	2.304	2.194	1.663	1.565
	(2.19)*	(2.03)*	(2.01)*	(1.96)*	(2.43)*	(2.30)*
Market Return	6.681		6.292		7.623	
	(0.38)		(0.28)		(0.57)	
Market Volatility	-8.615		-5.204		-5.941	
	(0.56)		(0.48)		(0.49)	
Firm Size	0.036		-0.567		0.229	
	(0.07)		(0.81)		(0.55)	
Market Condition	-0.455		0.694		0.059	
	(0.53)		(0.63)		(0.09)	
Offer Size	0.551		0.564		0.305	
	(2.17)*		(2.94)**		(2.85)**	
Firm Age	1.596		1.211**		1.519	
	(2.12)*		(2.22)		(2.64)**	
Internal Shareholding	-2.288		-1.778		-1.848	
	(2.42)*		(2.09)*		(2.82)**	
Listing Delays	0.019		0.609		-0.389	
	(0.03)		(0.86)		(0.92)	
Financial Crisis	0.197		-0.304		0.260	
	(0.12)		(0.15)		(0.21)	
A		-18.460		-11.367		-17.367
		(2.03)*		(0.99)		(2.50)*
B		0.912		0.950		0.335

	OLS (1st day)	EBA (1st day)	OLS (15th day)	EBA (15th day)	OLS (30th day)	EBA (30th day)
		(2.14)*		(1.77)		(1.03)
C		0.358		-0.262		0.341
		(0.22)		(0.13)		(0.28)
_cons	-8.104	-0.928	-1.116	-0.691	-7.215	1.364
	(1.41)	(0.42)	(0.15)	(0.25)	(1.64)	(0.81)
R^2	0.18	0.16	0.13	0.13	0.19	0.16
N	362	362	362	362	362	362
AIC	7.202		7.689		6.659	
SBIC	7.343		7.830		6.800	
HQIC	7.257		7.745		6.715	

*Note: This table exhibits the sample of 362IPOs which pertain to newly listed, demutualized and cross-listed issues floated on the AIM from 2001 to 2017. We apply EBA technique to predict the robust factors explaining the MAAR on the 1st, 15th and 30th trading day. A total of 715 combinations were formulated to process the information on the 1st, 15th and 30th trading day separately. Detail of model is VIF 10 (controls for the collinearity problem), which designates the confidence level the minimum and maximum for "ebavar" should be reported. If it is not specified, the default value is 0.95., CI modifies the confidence for the intervals of both the minimum and maximum for "ebavar". If it is not specified, the default value is .95. A, B and C exhibits the possible three combinations where offer price emerged as robust indicators. * p<0.05; ** p<0.01 represent significance level at the 5% and the 1% levels, respectively.*

To measure the sensitivity and the robustness of the factors affecting the short-run performance of IPOs in an alternative market, we compare the results of EBA technique with other traditional methods, which include the Akaike's information criterion (AIC), the Schwarz's Bayesian information criterion (SBIC) and the Hannan-Quinn information criterion (HQIC). The sample statistics are all displayed at the bottom of Table 9 below. We select the lower values of information criteria, and derive fewer variables related to market-, firm- and issue-specific characteristics. The application of the EBA technique finds that the model specification is limited to offer price, aftermarket risk, underwriter's prestige and international shareholding. Alternatively, traditional techniques (*e.g.* AIC, SBIC and HQIC) imply the offer price, aftermarket risk, underwriter's prestige, firm age and international shareholding. They are all selected on the basis of lower value of information criteria.

Table 9

Comparison of EBA Technique with Traditional Methods

	OLS (1st day)	EBA (1st day)	OLS (15th day)	EBA 15th day)	OLS (30th day)	EBA (30th day)
Offer price	-0.431	-0.431	-0.548	-0.548	-0.503	-0.503
	(3.49)**	(3.49)**	(3.48)**	(3.48)**	(2.27)*	(2.27)*
Risk	0.138	0.136	0.083	0.083	0.102	0.101
	(4.18)**	(4.14)**	(1.98)*	(1.97)*	(4.05)**	(4.02)**
Underwriter's Prestige	1.909	1.948	2.247	2.251	1.647	1.668
	(2.17)*	(2.22)*	(2.01)*	(2.01)*	(2.46)*	(2.49)*
Offer Size	1.609	1.590	2.011	2.282	2.46	2.405
	(2.16)*	(2.09)*	(2.28)*	(2.78)*	(2.416)*	(2.88)*
Firm Age	1.538		1.791		1.936	

	OLS (1st day)	EBA (1st day)	OLS (15th day)	EBA 15th day)	OLS (30th day)	EBA (30th day)
	(2.38)*		(2.82)*		(2.138)*	
Internal shareholding	-2.157	-2.122	(1.00)	-12.956	(2.30)*	-19.275
	(2.24)*	(2.44)*	-12.771	(1.12)	-18.213	(2.79)**
_cons	-10.717	-8.508	(1.11)	-4.302	(2.65)**	-5.670
	(2.10)*	(1.61)	(0.69)	(0.64)	(1.76)	(1.40)
R^2	0.18	0.18	0.13	0.13	0.18	0.19
N	362	362	362	362	362	362
AIC	7.173		7.259		6.532	
SBIC	7.238		7.251		6.598	
HQIC	7.199		7.291		6.580	

Note: The table depicts the comparison of estimation results between traditional methods derived from the OLS and EBA technique on the first day, 15th and 30th day of trading periods. AIC = Akaike's Information Criterion, SBIC = Schwarz's Bayesian Information Criterion, HQIC = Hannan-Quinn Information Criterion, and EBA = Extreme Bounds Analysis. Traditional methods are specified on the basis of permutations (715 regressions) and the best combination is selected on the basis of smaller values of AIC, SBIC, and HQIC.

Conclusions

This study identifies the factors that influence the short-run pricing performance of new issues in the AIM as compared to the main markets in which they are traded. For this purpose, we considered a sample of 362 IPOs including newly incorporated local, demutualized, and cross-listed IPOs. The results suggest that, on average, IPOs are underpriced by 2.48%, 2.62% and 2.16% on the first, fifteenth and thirtieth trading days in the AIM. Furthermore, we find that cross-listed IPOs are more underpriced as compared to newly local and demutualized IPOs. This difference may be due to enhanced prestige associated with cross-listed IPOs. This argument is supported by evidence that IPOs from the developed economies are more underpriced relatively to local IPOs in the emerging markets. It is reasonable to infer that cross-listed firms intentionally underprice their issuance to differentiate their status in the market from the local and demutualized IPOs. The statistical evidence supporting that inference is based on the findings stated above.

Alternatively, demutualized IPOs are less underpriced relatively to the local and cross-listed ones. This suggests that underwriters bear the smallest amount at risk. That attitude of risk aversion is related to information content attributing to the underwriters' access to obtain quality information. We also find that the offer price emerged as a robust determinant of short-run pricing performance. That finding is consistent with the proposition that higher offer price leads to lower underpricing and vice versa. In earlier studies, the issue of the optimal offer price has remained the topic of interest among researchers. The disparity in valuing the IPOs exists because of asymmetry of information among investors. Institutional investors have more resources and expertise to calculate the intrinsic worth of firm as well as the reasonability of the offer price, whereas individual investors interpret available information with less expertise. In the case of demutualized firms, both kinds of investors have enough information about the intrinsic worth of firms because the history of the financial performance is publicly available. Thus, both classes of investors valued demutualized IPOs on the same lines.

Conversely, in cross-listed IPOs, both classes of investors do not have equivalent information about foreign companies. As a consequence, their estimates of the value of IPOs are more problematic. The uncertainty could explain the exaggerated underpricing. This finding supports the results of EBA with regards to the offer price. Theoretical insights of the study have practical implications for those prospective investors who want to maximize returns to IPOs in the short-run.

References

Abdullah, Jia'nan, Z., and Shah, M.H., 2017. Dual-Class Firms: Evidence from IPOs of Chinese Firms Cross-Listed on US Exchanges. *Emerging Markets Finance and Trade*, 53 (7), pp.1691–1704.

Alim, K. and Ramakrishnan, S., 2017. Initial Public Offerings (IPO) Performance during Hot and Cold Issue Market in Pakistan. *SSRN Electronic Journal*.

Amin, M., Wu, J., and Tu, R., 2019. Signaling value of top management team: Evidence from Chinese initial public offerings on US markets. *Chinese Management Studies*.

Arora, N. and Singh, B., 2019. Impact of Auditor and Underwriter Reputation on Underpricing of SME IPOs in India. *Management and Labour Studies*.

Ascherl, C. and Schaefers, W., 2018. REITs and REOCs and their initial stock market performance: a European perspective. *Journal of European Real Estate Research*.

Badru, B.O. and Ahmad-Zaluki, N.A., 2018. Explaining IPO initial returns in Malaysia: Ex ante uncertainty vs signaling. *Asian Review of Accounting*.

Bakke, E., Leite, T.E., and Thorburn, K.S., 2016. Partial adjustment to public information in the pricing of IPOs. *Journal of Financial Intermediation*, pp.1–16.

Baluja, G., 2018. Does Size Matter for IPO Survival? Empirical Evidence from India. *Vision*, 22 (1), pp. 88–104.

Brobert, G., 2016. The global REIT market: initial-day performance of IPOs. *Journal of European Real Estate Research*, 9 (3), pp. 231–249.

Clarke, J., Khurshed, A., Pande, A., and Singh, A.K., 2016. Sentiment traders & IPO initial returns: The Indian evidence. *Journal of Corporate Finance*, 37, pp.24–37.

Clarkson, P. and Merkley, J., 1994. Ex ante uncertainty and the underpricing of initial public offering. *Canadian Journal of Administrative Sciences*, 11, pp. 54–67.

Colombelli, A., 2010. Alternative Investment Market:A Way to Promote Entrepreneurship.*Journal of Industry,Competition and Trade*, 10 (3), pp. 253–274.

Colombo, M.G., Meoli, M., and Vismara, S., 2019. Signaling in science-based IPOs: The combined effect of affiliation with prestigious universities, underwriters, and venture capitalists. *Journal of Business Venturing*.

Cooley, T.F. and Leroy, S.F., 1981. Identification and Estimation of Money Demand. *American Economic Review*, 71 (5), pp. 825–844.

Dhamija, S. and Arora, R.K., 2017. Initial and After-market Performance of SME IPOs in India. *Global Business Review*, 18 (6), pp.1536–1551.

Dodd, O. and Gilbert, A., 2016. The Impact of Cross-Listing on the Home Market's Information Environment and Stock Price Efficiency. *Financial Review*, 51(3), pp. 299–328.

Guo, H., Brooks, R., and Fung, H.-G., 2011. Underpricing of Chinese Initial Public Offerings. *Chinese Economy*, 44 (5), pp. 72–85.

Haggard, K.S., Walkup, B.R., and Xi, Y., 2015. Short-term performance of U.S.-Bound Chinese IPOs. *Financial Review*, 50 (1), pp. 121–141.

Hanafi, M.M. and Setiawan, A., 2018. Ownership concentration, institutional ownership, and IPO underpricing: evidence from Indonesia Stock Exchange. *International Journal of Governance and Financial Intermediation*.

Hawaldar, I.T., Naveen Kumar, K.R., and Mallikarjunappa, T., 2018a. Pricing and performance of IPOs: Evidence from Indian stock market. *Cogent Economics and Finance*.

Hawaldar, I.T., Naveen Kumar, K.R., and Mallikarjunappa, T., 2018b. Pricing and performance of IPOs: Evidence from Indian stock market. *Cogent Economics & Finance*, pp. 1–20.

Kashefi Pour, E., 2017. Entering the public bond market during the financial crisis: Underinvestment and asymmetric information costs. *Research in International Business and Finance*.

Khurshed, A., Kostas, D., and Saadouni, B., 2016. Warrants in underwritten IPOs: The Alternative Investment Market (AIM) experience. *Journal of Corporate Finance*, 40, pp. 97–109.

Komenkul, K. and Kiranand, S., 2017. Aftermarket Performance of Health Care and Biopharmaceutical IPOs: Evidence From ASEAN Countries. *Inquiry□: a journal of medical care organization, provision and financing*, 54.

Komenkul, K., Sherif, M., and Xu, B., 2017. IPOs' signalling effects for speculative stock detection: evidence from the Stock Exchange of Thailand. *Applied Economics*, 49 (31), pp. 3067–3085.

Leamer, E.E., 1983. Let ' s Take the Con out of Econometrics. *American Economic Review*, 73 (1), pp. 31–43.

Leamer, E.E., 1985. Sensitivity analyses would help. *American Economic Review*.

Levine, R. and Renelt, D., 1992. A sensitivity analysis of cross-country growth regressions. *American Economic Review*, 82 (4), pp. 942–963.

Mantell, E.H., 2016. A theory of underwriters??? risk management in a firm-commitment initial public offering. *Review of Quantitative Finance and Accounting*, 46 (1), pp. 179–193.

McLeod, M.S., Moore, C.B., Payne, G.T., Sexton, J.C., and Evert, R.E., 2018. Organizational Virtue and Stakeholder Interdependence: An Empirical Examination of Financial Intermediaries and IPO Firms. *Journal of Business Ethics*.

Migliorati, K. and Vismara, S., 2014. Ranking underwriters of European IPOs. *European Financial Management*, 20 (5), pp. 891–925.

Moosa, I.A. and Cardak, B.A., 2006. The determinants of foreign direct investment: An extreme bounds analysis. *Journal of Multinational Financial Management*, 16 (2), pp. 199–211.

Mumtaz, M.Z. and Smith, Z.A., 2015. Is growth rate implicit in IPO prices. *Romanian Journal of Economic Forecasting*, 18 (4), pp. 70–89.

Mumtaz, M.Z., Smith, Z.A., and Ahmed, A.M., 2016. An examination of short-run performance of IPOs using Extreme Bounds Analysis. *Estudios de Economía,* 43 (1), pp. 71–95.

Mumtaz, M.Z., Smith, Z.A., and Ahmed, A.M., 2016. The Aftermarket Performance of Initial Public Offerings in Pakistan. *The Lahore Journal of Economics*, 21 (1), pp. 23–68.

Obrimah, O.A., 2018. A New Test of the Signaling Theory of IPO Underpricing. *SSRN Electronic Journal*.

Pandya, F.H., 2016. After Market Pricing Performance of Initial Public Offerings (IPOs). *Jindal Journal of Business Research*, 5 (1), pp. 1–16.

Park, H.D. and Patel, P.C., 2015. How Does Ambiguity Influence IPO Underpricing? The Role of the Signalling Environment. *Journal of Management Studies*, 52 (6), pp. 796–818.

Purnanandam, A.K. and Swaminathan, B., 2004. Are IPOs really underpriced? *Review of Financial Studies*, 17 (3), pp. 811–848.

Rathnayake, D.N., Louembé, P.A., Kassi, D.F., Sun, G., and Ning, D., 2019. Are IPOs underpriced or overpriced? Evidence from an emerging market. *Research in International Business and Finance*.

Reilly, F.K. and Hatfield, K., 1969. Investor Experience with New Stock Issues. *Financial Analysts Journal*, 25 (5), pp. 73–80.

Ritter, J.R., 1984. Signaling and the Valuation of Unseasoned New Issues: A Comment Signaling and the Valuation of Unseasoned New Issues: A Comment. *Source: The Journal of Finance*, 39 (4), pp. 1231–1237.

Ritter, J.R., 1998. Initial public offerings. *Contemporary Finance Digest*, 2 (1), 5–30.

Rock, K., 1986. Why new issues are underpriced. *Journal of Financial Economics*, 15 (1–2), pp. 187–212.

Strauß, N. and van der Meer, T.G.L.A., 2017. News media coverage and initial public offerings in Germany: explaining flotation performance. *Corporate Communications*, 22 (4), pp. 523–541.

Sundarasen, S.D., Khan, A., and Rajangam, N., 2018. Signalling Roles of Prestigious Auditors and Underwriters in an Emerging IPO Market. *Global Business Review*, 19 (1), pp. 69–84.

Tan, Q., Dimovski, W., and Fang, V., 2015. The Underpricing of Infrastructure IPOs: Evidence from China. *Review of Pacific Basin Financial Markets and Policies*, 18 (04), pp. 15-25.

Yang, T., Hou, W., and Li, P., 2018. Short-run price performance of venture capital trust in initial public offerings. *Finance Research Letters*, 25, pp.177–182.